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ANALYTICAL APPROXIMATIONS

Volume II

Cecil Hastings, Jr.

James P. Wong, Jr.

P-415

1 July 1953

The RAND Corporation
SANTA MONICA · CALIFORNIA

6)

4-15-53

Analytical Approximation

Bessel Function of Imaginary Argument: To better than .00007 over (0,2),

$$e^{-x}I_1(x) \doteq \frac{.4981x + .0066x^2}{1 + .9805x + .4477x^2} .$$

Cecil Hastings, Jr.
James P. Wong, Jr.
RAND Corporation

4-20-53

Analytical Approximation

Bessel Function of Imaginary Argument: To better than .000,006 over (0,1),

$$e^{-x}I_1(x) \doteq \frac{.49974x - .01695x^2}{1 + .95935x + .36282x^2} .$$

Cecil Hastings, Jr.
James P. Wong, Jr.
RAND Corporation

Analytical Approximation

Bessel Function of Imaginary Argument: To better than .0005 over $(0,\infty)$,

$$e^{-x}I_1(x) \doteq \frac{x}{\sqrt{3.78 + 9.81x + 3.09x^2 + 6.36x^3}} .$$

Cecil Hastings, Jr.
James P. Wong, Jr.
RAND Corporation

Analytical Approximation

Mach Number in Terms of Pressure Ratio: To .001 over $.3 \leq M \leq 1.0$ the inverse of

$$x = \frac{P_s}{P_A} = \left[1 + \left(\frac{\gamma-1}{2}\right)M^2\right]^{-\frac{\gamma}{\gamma-1}} ,$$

where $\gamma = 1.4$, is given by

$$M \doteq \frac{2.714 - 2.625x}{1 + 1.650x - 1.955x^2} .$$

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James P. Wong, Jr.
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6-10-53

Analytical Approximation

Bessel Function of Imaginary Argument: To better than .00005 over $(2,\infty)$,

$$e^{-x}I_1(x) \doteq \frac{x}{\sqrt{10.281 + 3.752x + 4.541x^2 + 6.296x^3}}.$$

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